

Minors Offered by the Mellon College of Science

The Mellon College of Science offers several minors to students interested in broadening their scientific training or acquiring a level of expertise in a particular scientific field. The intercollege minors described below are designed to supplement your degree in science; the departmental minors offer you a means of exploring another field and are open to students throughout the university.

Intercollege Minors

Please see the descriptions below.

- Environmental Science
- Health Care Policy and Management
- Scientific Computing

Departmental Minors in the Mellon College of Science

For descriptions, please see the departmental sections which follow.

- Biological Sciences
- Chemistry
- Computational Finance
- Discrete Mathematics and Logic
- Mathematical Sciences
- Physics

Minor in Environmental Science

Advisor: Eric Grotzinger

The primary mission of the environmental sciences minor is to prepare students in the Mellon College of Science for careers or postgraduate education in the diverse fields of environmental science. We feel strongly that these endeavors must be grounded in strong fundamental science; consequently, the program extends majors in the Mellon College of Science.

We also award minors to students from other colleges, provided that they can build a course of study with sufficient scientific rigor to meet the standards of the program.

As a capstone program, the minor is built around advanced courses that extend as well as broaden the specialized education associated with the major programs. Environmental sciences are highly interdisciplinary in nature, and while it is necessary that students have an exposure to introductory courses in several of these disciplines, it is by no means sufficient; in-depth knowledge is required. We encourage all students to pursue generally broad studies, including subjects that encompass human interactions with the environment, and will provide guidance to all students interested in the area. We encourage those students who intend to devote focused attention to environmental sciences to pursue this minor.

Environmental Sciences are broadly defined as pursuits designed to develop fundamental understanding of the natural environment and human interactions with the environment. Research problems are frequently motivated by perceived problems (air, water and soil pollution, reduction in biodiversity, global climate change, etc...), but inevitably extend to the fundamental mechanisms underlying these phenomena. Research can be highly specialized (focusing for example on the biochemistry of a particular enzyme or the synthesis of a particular catalyst) or highly general (focusing for example on the complex, nonlinear interactions of populations on complex ecosystems). Our program is designed to ensure that students of the field are conversant with questions on all of these scales, from the microscopic to the global.

Required Courses:

Science Requirements (27 units)

| | | |
|------------|-----------------------------|------|
| 09-217 | Organic Chemistry I | 9-10 |
| or 09-219 | Modern Organic Chemistry | |
| 09-218 | Organic Chemistry II | 9-10 |
| or 09-220 | Modern Organic Chemistry II | |
| 03-231/232 | Biochemistry I | 9 |

Laboratory Requirement (12 units)

| | | |
|--------|---|----|
| 09-221 | Laboratory I: Introduction to Chemical Analysis | 12 |
|--------|---|----|

Statistics Requirement (9 units)

| | | |
|--------|---|---|
| 36-217 | Probability Theory and Random Processes | 9 |
| 36-225 | Introduction to Probability Theory | 9 |
| 36-247 | Statistics for Lab Sciences | 9 |

Additional Course Requirements:

Complete one course from each of the following groups (substitutions can be made with the approval of the Environmental Science Advisor).

Note: Courses taken in these categories cannot also be counted toward requirements for a primary major.

Science (Mechanism)

| | | |
|--------|---|---|
| 03-442 | Molecular Biology | 9 |
| 09-510 | Chemistry and Sustainability | 9 |
| xx-xxx | Course credit may be assigned for research, fieldwork, or coursework performed outside of CMU at the discretion of the minor advisor. | |

Engineering (Process)

| | | |
|--------|---|----|
| 12-100 | Introduction to Civil and Environmental Engineering | 12 |
| 12-201 | Geology | 9 |
| 12-351 | Environmental Engineering | 9 |
| 12-651 | Air Quality Engineering | 9 |
| 19-440 | Combustion and Air Pollution Control | 9 |

Policy

| | | |
|--------|---|---|
| 19-424 | Energy and the Environment | 9 |
| 73-148 | Environmental Economics | 9 |
| 73-358 | Economics of the Environment and Natural Resources | 9 |
| 79-372 | Cities, Technology, and the Environment | 9 |
| 79-381 | Energy and Empire: How Fossil Fuels Changed the World | 9 |
| 80-344 | Management, Environment, and Ethics | 9 |
| 99-238 | Materials, Energy and Environment | 9 |

Minor in Health Care Policy and Management

Sponsored by:

H. John Heinz III College
Dietrich College of Humanities and Social Sciences
Mellon College of Science

Faculty Advisors:

Jason D'Antonio, Mellon College of Science
James F. Jordan, H. John Heinz III College

The face of health care is changing. The practice of medicine is being fundamentally altered by the forces of change in public policy, health care organizations and in the industry as a whole. The role of individual professionals in this industry is changing as rapidly as the industry itself. Traditional career paths have disappeared overnight to be replaced by new opportunities that require new skills. New organizations are placing new demands on their professional and medical staffs. The criteria of efficiency and financial stability are entering the domains of diagnosis and treatment.

This minor is designed to provide students considering a career in the health professions with an understanding of how these changes are likely to affect their careers. Students will become familiar with the critical policy and management issues and will begin to learn to operate effectively in the emerging health care environment. The curriculum combines economic, organizational, managerial, historical and psychological perspectives on these issues to provide a foundation for a deepened understanding of the changing structure of health care organizations and policy.

Required Courses for HCPM Minor(42 Unit minimum)

Seven courses (a minimum of 60 units) are required to complete this minor. Entry into the minor requires completion of 73-100 Principles of Economics or 88-220 Policy Analysis I or the equivalent by approval.

Required Courses

Students are required to take the following courses.

| | | |
|--------|----------------------|----|
| 79-332 | Medical Anthropology | 9 |
| 94-705 | Health Economics | 12 |
| 90-836 | Health Systems | 6 |
| 90-861 | Health Policy | 6 |

Elective Courses 24 units

Complete a minimum of 24 units.

Heinz College Courses

| | | |
|--------|---|----|
| 90-721 | Healthcare Management | 6 |
| 90-818 | Health Care Quality & Performance Improvement | 6 |
| 90-830 | Introduction to Financial Management of Health Care | 6 |
| 90-831 | Advanced Financial Management of Health Care | 6 |
| 94-706 | Healthcare Information Systems | 12 |
| 90-832 | Health Law | 6 |

Humanities and Social Sciences Courses (9 units each)

| | | |
|--------|---|---|
| 76-494 | Healthcare Communications | 9 |
| 79-318 | Sustainable Social Change: History and Practice | 9 |
| 80-245 | Medical Ethics | 9 |
| 80-247 | Ethics and Global Economics | 9 |
| 85-241 | Social Psychology | 9 |
| 85-442 | Health Psychology | 9 |
| 85-446 | Psychology of Gender | 9 |

Please note that some of these courses have prerequisites that will not count toward the completion of the requirements for this minor.

Minor in Scientific Computing

Advisor: Eric Grotzinger

Sometimes called “computational science,” scientific computing is the application of high-performance computers and modern computational technologies to problems in the sciences and engineering. Research in this area is inherently multidisciplinary, requiring strong ties with a scientific discipline.

MCS students can easily build on their scientific training with this applied computational program. The curriculum consists of five areas of concentration, which span the natural sciences, mathematics, programming and research. The curriculum is structured to allow flexibility in choosing courses that meet students’ particular interests or best compliment their major. The minor is also a natural choice for students majoring in any technical area.

Required Courses

Students must meet the requirements of the following categories:

A. Non-Introductory Science Requirement (9-12 units)

Complete 1 course from Biological Sciences, Chemistry, or Physics at the 200 level or higher, excluding those courses listed below as part of the requirements of the minor. Courses with a significant science component from other colleges may be substituted with approval from the program administrator.

B. Computational Science Requirement (18-24 units)

Complete 2 of the following courses:

| | | |
|--------|--|----|
| 03-250 | Introduction to Computational Biology | 12 |
| 03-511 | Computational Molecular Biology and Genomics | 9 |
| 09-560 | Computational Chemistry | 12 |
| 15-386 | Neural Computation | 9 |
| 33-241 | Introduction to Computational Physics | 9 |

C. Computational Methods Requirement (9 units)

Complete one of the following courses from outside of your home department.

| | | |
|--------|--------------------------------------|----|
| 21-320 | Symbolic Programming Methods | 9 |
| 21-369 | Numerical Methods | 9 |
| 33-232 | Mathematical Methods of Physics | 10 |
| 33-456 | Advanced Computational Physics | 9 |
| 36-410 | Introduction to Probability Modeling | 9 |

D. Applied Scientific Computing Research Project(s) (9 units)

Complete one approved research project in an area of applied scientific computing. In some cases, this research could be replaced with 9 units of an approved project-based course in advanced scientific computing. The

administrator of the minor will maintain a list of appropriate courses. Under special circumstances summer research may count toward this requirement, although it cannot be counted toward the units required for graduation.
E. Complete any additional course from category C or D (9 units)